THE ANALYST.

FEBRUARY, 1894.

PROCEEDINGS OF THE SOCIETY OF PUBLIC ANALYSTS.

The annual general meeting of the members of the Society was held at Burlington House on Wednesday, January 24. The President, Sir Charles A. Cameron, occupied the chair.

The following gentlemen were proposed as members: James Edmunds, M.D., 29, Dover Street, Piccadilly; Frederick Dunn, Flinder's Lane, West, Melbourne; Arthur R. Ling, 45, Lambton Road, Cottenham Park, Wimbledon. The following gentlemen were duly elected: as honorary member, Dr. W. A. Tilden, Mason's College, Birmingham; members, Dr. J. Duncan, St. Petersburg; Percy Andrews Ellis Richards, A.I.C., Charing Cross Hospital, W.C.; and Robert Walter Oddy, F.I.C., Waterhouse, Toad Lane, Rochdale.

The accounts for the year, which had been audited by Messrs. Chattaway and Kitto, were presented by the treasurer, Mr. E. W. Voelcker. They showed that the Society was in a more flourishing condition than at any previous period of its existence.

In presenting the report, Mr. Voelcker referred briefly to the death of the late honorary treasurer, Professor C. W. Heaton, and said that all who were personally acquainted with him had felt his loss keenly, for in him the Society had not only lost a valuable officer, but a very good friend. Mr. Heaton had been ill for a very considerable length of time, and a great deal of his work had latterly been done by Mr. Nimmo, to whom the thanks of the Society were due for the excellent way in which he had kept the accounts, and also for much valuable assistance which he had given him (Mr. Voelcker) in taking on the duties of the office of treasurer.

Mr. James Baynes moved, and Mr. E. W. J. Jones seconded: 'That the report and accounts as presented be adopted.'—This was carried unanimously.

The President moved a vote of thanks to the Chemical Society for allowing the Society the use of the convenient and well-situated room which was placed at their disposal for holding meetings; and that this resolution be communicated to them by the honorary secretaries.

The officers for the ensuing year, as proposed by the Council, were elected.

The President then read his annual address.

Mr. Hehner proposed a cordial vote of thanks to the President for his address, which was seconded by Mr. Allen, and carried unanimously.

The President thanked the meeting for the cordial manner in which they had passed the resolution.

The members and their friends adjourned to the Criterion Restaurant, where the annual dinner took place, the President being in the chair.

THE VINEGAR QUESTION.

(*Discussion held at the Ordinary Meeting, Nov. 1st, 1893, continued from page* 15.)

With reference to the strength of vinegar, I have had several samples lately which were unreasonably dilute, one containing as little as 2·28 per cent. of acetic acid. This was taken under the Sale of Food and Drugs Act, and there is no doubt in this case it had been watered by the retailer, who was fined. The question of the limit of strength to be permitted in vinegar has quite recently acquired a new and very special interest in consequence of the action taken by a member of the Society, Mr. Estcourt, the analyst for Manchester. In Manchester there have been some prosecutions for selling watered vinegar, on Mr. Estcourt's certificate, and that gentleman regarded all vinegar as watered which contained less than 4·6 per cent. of acetic acid. There is no legalized limit of strength for vinegar, as there is now for spirits, except for pharmaceutical purposes, and the question arises whether a vinegar manufacturer has a right to sell a vinegar of any strength that he chooses. My view is that he has not. In 1874 this Society adopted "3 per cent. of real acetic acid," as the minimum limit of strength for vinegar. That is the expression used in the definitions of the Society of Public Analysts. The question arises as to what was intended by "real acetic acid" at the time, and my impression is that the term was really intended to signify acetic anhydride, $C_4H_6O_3$, which was at that time not unfrequently called "real acetic acid." But whatever was *intended*, the 3 per cent. limit has been generally regarded, both by public analysts and manufacturers, as referring to the compound, $C_2H_4O_2$, which is the formula of glacial acetic acid. But at any rate, whichever was the meaning to be attached to the term "real acetic acid" employed in the Society's definitions, Mr. Estcourt gave evidence to the effect that no genuine vinegar was sold *in Lancashire* with less than 4·3 per cent. of acetic acid, $C_2H_4O_2$, and on that ground he condemned a sample as containing 30 per cent. of water because it had only 3·6 per cent. (?) of acetic acid in it. Since, I have received from him the following letter, which he desires me to read to the meeting:

"In our Manchester cases we avoided any complication by asking for '*malt* vinegar,' which cannot be *brewed* from malt and grain at so low a strength as 3 per cent. hydrated acetic acid. The manager of Messrs. Grimble and Co. admitted honestly that the vinegar they brewed was *watered*. This is all I certified. Of course, you will recollect the limits suggested in 1874-75 have not been adopted in their entirety, and especially is this the case with milk, where 2·5 of fat was suggested as sufficient."

It appears from this that Mr. Estcourt holds that a vinegar manufacturer has no right to dilute his vinegar with water. Whatever strength it is originally brewed it is to be kept at. He appears under the impression that the text-books are correct in stating that vinegar brewers pitch their wort according to the strength of vinegar they want to make. But in practice vinegar is always brewed of full strength, and subsequently diluted to the required strength, which is regulated by the price. I consider the maker is within his right in so doing, just as the distiller and spirit merchant have a right to dilute the spirit below the strength at which it is originally

produced. It would be absurd to employ the plant in brewing a vinegar of half strength. The different strengths of vinegar are usually distinguished by numbers, which numbers are generally regarded as representing the number of grains of carbonate of sodium neutralized by an ounce of vinegar; though of late years—in addition to the numbers 24, 22, 20, 18, and 16—"diamond," "double diamond" and "V" have been added. I believe no vinegar is sent out by the manufacturer containing less than 3·2 per cent. of acetic acid, $C_2H_4O_2$, and if it does happen it is only through carelessness. If we were to raise the present limit of strength from 3·0 to 3·5 per cent. of acetic acid, $C_2H_4O_2$, we should interfere with the sale of double-diamond vinegar, and possibly with the "diamond" of some makers, but not with No. 16 or the higher qualities. I have consulted several vinegar makers who say that the action which I now propose we should take will only mean that the cheaper vinegars will be cut out, and if the Society of Public Analysts decide that the vinegar limit should be raised to 3·8, or even 4 per cent., they are perfectly willing to accept it, provided they have due notice of the change. But, until the change is deliberately made, I think we should adhere to the 3 per cent. limit in the sense in which it has been generally understood by public analysts and respected and acted on by manufacturers.

Mr. John Pattinson, through the secretary, made the following communication:

"I beg to urge strongly that public analysts should take the position that vinegar which is bought and sold as malt vinegar, should, as its name implies, be made from malt and from malt only. Genuine malt vinegar has a special flavour and aroma of its own, which vinegar made from other sources does not possess; and the public ought to be able to obtain it when it is asked for. If it be once conceded that malt vinegar may be made from a mixture of malted and unmalted grain, it is difficult to see on what principle a vinegar made chiefly from rice, maize, or glucose, to which a few grains of malt have been added, may not also pass muster as malt vinegar, for this also could be represented as being made from malted and unmalted grain.

"Genuine malt vinegar can now be had in the market, and there are more than one firm of makers of it; but if public analysts are willing to pass vinegars made from malted and unmalted grain as malt vinegars, the public may bid farewell to all hope of ever being able to obtain genuine malt vinegar in the future, for it will be beaten out of the market by these cheaper and inferior so-called malt vinegars.

"Chemists have the means of proving fairly conclusively by analysis whether or not a vinegar has been produced from malt and unmalted barley, and they are able to distinguish such vinegar from one made largely from rice, maize, glucose, or sugar. It may be they cannot at present distinguish between vinegar made from malted barley and that made from a mixture of malted and unmalted barley, but this is not a valid reason for admitting that unmalted barley may be legitimately used in making malt vinegar. Moreover, a time may come when chemists will be able by analysis to show that unmalted barley has been used; it would therefore be unwise to admit now that unmalted barley may be legitimately used.

"I see no reason why vinegars made chiefly from unmalted barley, maize, rice, or other grain, or from sugar or molasses, should not be sold as "vinegar," or as barley vinegar, rice vinegar, grain vinegar, sugar vinegar, or by any other distinguishing name, but they should not be sold as malt vinegar.

"I am strongly of opinion that public analysts should define malt vinegar as 'an infusion of malted barley, which has undergone alcoholic and acetic fermentation.'"

Dr. W. Morgan desired to make a few observations on malt. In South Wales a large amount of malt was made by so-called maltsters. He thought that no one would for a moment doubt but that malt was a term applied to a mixture of malt and barley only. The term maltster, as he understood it, was applied to a man who produced malt from barley, and from barley only. South Wales was notorious for the distillation of pyroligneous acid from wood, and he knew, of his own personal knowledge, that what was sent out as rectified pyroligneous acid obtained by redistillation was called in the trade pyroligneous acid. There could not possibly be a trace of tarry matter in it.

Mr. A. H. Allen wished to know if he was to understand that what was known in South Wales as pyroligneous acid was a product obtained by neutralizing the acid distillate from wood with lime or soda, treating the salt obtained with sulphuric acid and re-distilling? According to his information an acid recovered from a soda or lime salt was known in the trade as "acetic acid," and distinguished from "pyroligneous acid."

Dr. W. Morgan, in reply, said that acetic acid and pyroligneous acid were synonymous terms, just in the same way that spelter and zinc were synonymous. Examination for tarry matters for the purpose of proving the presence of pyroligneous acid in a vinegar was of no value whatever. Pyroligneous acid was an unfortunate term to use, because it might convey to the mind of the uninitiated that it contained tarry matters, and all sorts of other abominations. Since his attention had been called to the matter, he was very careful in saying that it was acid obtained from wood, or other material, and not from malt. A barrister informed him that he would contend that if malt vinegar was made from a mixture of 10 per cent. of malt, and the rest starch, it was still a malt vinegar, and that it was not necessary that the vinegar should be made wholly from malt in order that it should be called malt vinegar.

Mr. G. Embrey believed that the point upon which it was really desired to come to an agreement was, that the members of the Society should agree upon what vinegar was, and what malt vinegar was, and what "faked" vinegar was. He did not think that the matter was so difficult as Mr. Allen seemed to imagine. There could be no doubt that malt was malted barley, and nothing else. No malt-vinegar brewer used malt entirely, but used 10 per cent. of malt and 90 per cent. of barley, and he malted the barley from the 10 per cent. of malt. That seemed to him the method adopted by the really honest malt-vinegar brewer. When it came to the question of what was vinegar, there could be no doubt that Mr. Hehner's definition given at Birmingham, that it was "a vegetable juice which had undergone alcoholic and acetic fermentation," was the correct one. With regard to pyroligneous acid, he did not think there ought to be any difficulty in saying that that was not vinegar at all. Dr. Morgan was quite right in saying that in South Wales the name pyroligneous acid was given to the purest acid, even if it had been derived by re-distillation or from an acetate. Public analysts ought to agree among themselves, as they had done in

former times, as to what vinegar was: the Birmingham case had shown what vinegar was not. It was also agreed that a mixture of acetic acid and burnt sugar was not vinegar. To let a manufacturer take rice, subject it to the action of sulphuric acid, and obtain an impure acid from that, and let him call it malt vinegar, seemed to him to be going a little too far.

Dr. Bernard Dyer thought that the difficulty was not so much in defining, but in finding out whether an article came under the definition. It might interest some to know that the trade in phosphate of potash was said to have increased since the vinegar agitation began; and he knew that people who sold acetic acid also dealt in phosphate of potash.

Mr. Cassal, having made some remarks with respect to certain legal and analytical aspects of the question, said that he would like to have a clear statement as to what was the position of the public analyst when he had to certify upon samples brought to him under the name of "vinegar." With regard to the distinctions between malt vinegar, alcohol vinegar, sugar vinegar, and so forth, it was highly desirable to arrive at an understanding as to dealing with mixtures of these preparations. It was of the utmost importance they should arrive at clear definitions of the articles which were submitted to them as public analysts, and he ventured to suggest that, before public analysts certified in regard to new forms of adulteration, there should have been a discussion in the Society, and a general agreement arrived at as to what ought to be done. Otherwise there would be regrettable differences of opinion in Courts of Law, and the profession as well as the public would suffer.

Mr. Hehner, in summing up the discussion, said that, taken together, the statements made by Dr. Dyer and by Mr. Allen were very remarkable, the former informing them that manufacturers in some cases were now adding phosphate of potassium to their products, in order that they might pass the analytical tests; the latter, on the contrary, that other manufacturers were abstracting phosphoric acid, in order to increase the keeping qualities of the vinegar. These statements appeared to show how little reliance could be placed upon the arguments advanced on the part of the makers. He (Mr. Hehner) feared that behind the makers stood unscrupulous chemists, who lent themselves to the screening of adulteration. It was also remarkable that no difficulty had been found in laying down the limits of composition, including phosphates, in respect to another article of infinitely greater importance than vinegar—namely, wine. Yet he (the speaker) had heard absolutely no suggestion made that wine was largely "faked" with a view of circumventing the analyst. He was convinced that the present tricks adopted by one portion of the vinegar trade were but passing events, and that the trade would not only soon find its level again, but find itself all the better and purer for the agitation, upon which so much comment had been made.

Mr. Embrey, he thought, had emphasized the main point in the discussion when he said that the chief requirement was a decision as to what malt-vinegar was. It had been decided, and fairly conclusively so, that wood-acid was not vinegar. There was also an agreement of opinion that vinegar, without a qualifying adjunctive, might

be made from many sources, provided it was a real product of alcoholic and acetic fermentation; but there was no manner of agreement as to the nature of malt-vinegar. In the Birmingham case, at its first (Police Court) hearing, the chemists giving evidence for the prosecution thought that all vinegar should be malt-vinegar, unless expressly acknowledged to be made from other sources. But on closer consideration it was seen that this was an untenable position, and one which would much interfere with legitimate vinegar manufacture; and it was then agreed that vinegar should be defined as a vegetable juice or infusion which had undergone alcoholic and acetic fermentation. Mr. Allen had shown to the members of the Society the many difficulties involved by the adoption of that definition. The next question which was sure to come prominently to the front was, in his (Mr. Hehner's) opinion, the following, What ought malt-vinegar to be made from? Mr. Pattinson took the view that malt-vinegar should be strictly what the name implies, made from malt and water only. This was the real logical and common-sense view of the matter, but as analytical knowledge of the present time did not enable public analysts to distinguish between vinegars made from malt only, and those made from malted and unmalted barley, it appeared to him to be useless to insist upon a definition which could not be controlled or enforced; and he was of opinion that it was better to adopt, for the present at least, the definition that malt-vinegar was the product of the alcoholic and acetic fermentation of an infusion of malted and unmalted barley. He could not concede for a moment that starch hydrolyzed by sulphuric acid might be substituted for the inversion by diastase without altering the character of the product. Only the widest chemical outlines of the chemistry of fermentation were at present understood, and we were in ignorance of the causes which determine the physiological effects of the products of fermentation. The chemist was far too apt to jump to the conclusion that, because the main products of a process had been ascertained, therefore we knew and understood the process. The argument had often been employed in connection with this matter, that, inasmuch as starch yielded on inversion by any process sugar, which in turn yielded alcohol, from which the acetic acid of the vinegar was derived, therefore one source of acetic acid was as good as another. But though pure alcohol might be the same from whatever source it came, it was a fact beyond dispute that the products of fermentation of grape-juice were wholesome, and not liable to produce unpleasant physiological effects beyond those attached to pure alcohol, while the products of fermentation of, say, potato-starch sugar were physiologically most objectionable and injurious.

For the sake of ordinary commercial honesty, and in order to uphold the spirit and intention of the Sale of Food and Drugs Act, analysts should, in his opinion, insist that an article called by a specific and definite name should be made of the specific and definite article which gave it its appellation. No one could object to sugar-vinegar being honestly sold under that name. He went further, and thought that if a manufacturer called dilute wood-acid "wood-vinegar" he was acting straightforwardly and did not deceive purchasers. Similarly, it might be expected that if a maker sold vinegar under the name of malt-vinegar, the public had a right to insist that the article should be really made from malt, and that without the slightest equivocation.

As to the proportion of acetic acid in vinegar, he would like analysts to be careful not to come rashly to conclusions. He had lately met with a sample of vinegar which had within a very short time deteriorated in the cask by growth of fungus, the acetic acid falling from upwards of 4 per cent. to as little as 2·9, watering being excluded from the circumstance that all other constituents of the sample had remained unaltered. When a barrel was nearly empty and the surface of the fluid exposed largely to the air, the contents often rapidly lost in strength. Of course, the vendors should be obliged to sell vinegar of fair strength, and it could be no excuse to plead that the article had altered from natural causes, but the lowest strength did not necessarily imply intentional and fraudulent watering.

He believed that in most cases analysis enabled the chemist to obtain a very good idea of the materials employed in the manufacture of the sample. The presence of aldehyde and alcohol, causing an abundant iodoform reaction in the distillate from the neutralized sample, was fairly conclusive evidence of fermentation, and the sample was a real vinegar. Vinegar made from sugar contained hardly any albuminoids, while that from malt contained about 0·7 per cent. Vinegar prepared by acid inversion of rice and other starch always contained a high ash with abundance of sulphates. The ash of a cane-sugar vinegar was readily fusible, even over a moderate argand flame; that of a malt or a glucose vinegar did not readily fuse. Sugar-vinegar yielded an ash composed mainly of potash salts, as raw cane-sugar was employed, and never refined sugar. For that reason he thought that the estimation of potash with a view to prove the presence of grain vinegar was useless, both grain and raw sugar containing much potash.

Mr. Allen had referred to his (Mr. Hehner's) mode of calculation of the original total solids, and had stated that, as it did not take any account of the loss involved in the process of manufacture, it might be improved upon. No doubt it might be improved, but when losses were taken into consideration, the analyst would at once be required to give his reasons for any assumption he might make. And the loss varied very much in different factories. Besides, the method of calculating the original total solids adopted by him (Mr. Hehner) was the most favourable that could be adopted, all errors being to the benefit of the manufacturer.

It had not been altogether fortunate that Dr. Hill had been successful in the first case brought against wood vinegar. There was no chemical evidence that the sample consisted of wood-acid, although the makers freely acknowledged that Dr. Hill's conclusions were quite correct. But other public analysts following Dr. Hill had often not been so fortunate in their conclusions, for, as they now knew, it by no means followed that because a vinegar was not malt-vinegar it must necessarily contain wood-acid. It was advisable to be exceedingly cautious in the expression of an opinion, and all the circumstances of the case should be taken into consideration. Supposing an analyst examined a vinegar which contained 4 per cent. of total solids and 1 per cent. of ash (an actual case), but which was almost devoid of phosphoric acid, it would be rash and injudicious for him to say that that sample contained wood-acid in proportion to the deficiency of phosphoric acid—say, 75 per cent.—because the 4 per cent. of total solids would not be derived from the wood-acid, which

constituted three-fourths of the article, but from the one-fourth of real vinegar, and this, therefore, would have had to contain 16 per cent. of total solids, which would be absurd. The same argument applied to the ash, brought that of the real vinegar taken to 4 per cent., and this was equally impossible. As a matter of fact, the sample in question was composed of a mixture of a glucose and a sugar vinegar, and was quite devoid of wood-acid.

He wished, lastly, to say a few words as to the legitimacy of removing any substance which was an essential constituent of any commercial article, and without which it was not the real commercial article. He wished to protest against the removal of phosphoric acid or of albuminoids from vinegar, and thought that the manufacturer had absolutely no right to effect such a removal. Would anyone tolerate the removal of phosphoric acid or of tartaric acid from wine? The removal was prejudicial to the purchaser, and its sole object was to enable the maker to obviate the proper process of ageing which the article ought to be subjected to, and to hasten the sale of an otherwise immature and unsaleable article. Here, again, he was of opinion that the long-recognised and legitimate modes of manufacture should be adhered to, and the introduction of chemical meddling with food materials resisted. It should not be left to the discretion of the manufacturer of articles of food to say which constituents were valuable and essential and which were not, and in no case should such removal be effected without due notice to the purchaser.

Mr. Allen, in reply, said that he entirely disagreed with Mr. Hehner that a vinegar manufacturer was not at liberty to remove things prejudicial to vinegar. It was, in his opinion, the manufacturer's business to make good vinegar, and so long as he sold it for what it was, he was at perfect liberty to remove any objectionable constituents which impaired its keeping properties. The reason why malt vinegar brewers desired to remove the albuminoids was that they rendered the vinegar particularly apt to undergo secondary decomposition. He believed the decomposition of vinegar, with consequent change of strength, would always be accompanied with a very visible formation of mould, and that the vinegar would become turbid. He usually regarded the presence of potash as distinguishing true fermentation vinegar from the outside products, and he quite agreed with Mr. Hehner that its value would be diminished when trying to discriminate between different kinds of fermentation vinegar. He had been recently asked in Court if he knew a book called "Commercial Organic Analysis," in which there was a statement made that "malt vinegars have a high density (1021 to 1025), and yielded 5 to 6 of extract containing a notable proportion of phosphates." He believed that this statement was true at the time it was written, some ten years ago: the fact being, that vinegar-brewers conducted their fermentation better at the present time—they pushed it further, leaving less sugar in, and, at the same time, there were less albuminoids than there used to be formerly. Hence vinegar kept much better, as now manufactured, than it did formerly, and there was no excuse for the addition of sulphuric acid as a preservative, as was formerly permitted by the Excise.

Mr. Embrey suggested that the matter should be referred to the Council for report, and that the report should be considered by the Society at a special meeting.

The following letter has been subsequently received from Mr. E. W. T. Jones:

"I consider it would be a calamity for the Society to admit a deviation from the strictly scientific formula, viz., a *product initiated by malt only;* raw grain may be used with it, in the mash-tun, because the utilization of its starch is absolutely restricted to the action of the malt, and therefore the constituents of the wort may be said to be strictly malt products. I would not admit the products of starch hydrolyzed by sulphuric acid or in other ways than by diastase. This gives a glucose vinegar.

"I know some of my friends will say, Can we analytically differentiate these products and mixtures of them when made into vinegar, and if we cannot fully do this, what is the use of making any fuss about it? But I reply that, as purists, we must adhere to a principle, and what may not be an easy analytical problem to-day, may by work and progress become one to-morrow. As public analysts, is not this our experience over and over again?

"A wort made by the acid degradation of starch is not the same as one made by diastatic hydrolysis with the latter; under the most favourable circumstances the transformation does not go practically beyond four-fifths maltose and one-fifth dextrin, and much of this latter remains in the finished vinegar and gives it 'body,' but the acid conversion, as *carried out*, produces dextrose, gallisin, etc.; little or no dextrin is left to give 'body' to the vinegar. Oh, but some of my glucose friends say, what is the value of the dextrin or 'body'? Vinegar without it is preferable, and our product for several reasons will keep better. I do not care if all and more than this is true—as public analysts we have nothing to do with such a question—if malt vinegar is asked for it must be supplied, and the public must decide by their demand what it is they require.

"I may mention that genuine malt vinegar, agreeing with the formula I give, is being made on a very large scale, so that I am not insisting on anything impracticable. I must also admit that most of the vinegar now sold as 'malt' is mixed with the glucose product, but in time public analysts must remedy this."

VINEGAR.

By Edward Collens.

(*Read at the Meeting, December 6th*, 1893.)

Messrs. Allen and Moor, in their paper on vinegar, published in your issue of October, 1893 (vol. xviii., p. 240), have fallen into certain errors in their treatment of the history of the subject, which I will endeavour to correct.

In the first place, one is led to believe that the use of raw grain is a very recent departure, consequent on the example set the vinegar-maker by the brewer. This is such a complete inversion of fact that a short account of the doings of the former during the last hundred years will be the speediest reply.

Originally molasses was the only raw material used in the manufacture of English commercial vinegar. The West Indian planter conducted his operations on a most wasteful plan, and the distiller and vinegar-maker profited by it; hence the old vinegar houses are established in the ports which were then the centres of the West Indian trade, or in places within easy touch of these, *e.g.*, London, Bristol, Stourport; and to this day a survival of the molasses-vinegar trade remains, for the malt vinegar-maker must colour his paler article to make it resemble the older vinegar ere the consumer will purchase it.

But with increasing chemical knowledge, good molasses ceased to be a drug in the market, and the vinegar-maker and his friend the distiller—for in their earliest stages the two trades are, of course, identical—availed themselves of the fact that a mixture of malt and raw corn when suitably treated gave them all they wanted.

This product was advertised on the show-cards of the day as 'Patent Malt Vinegar,' but the word 'patent,' I am inclined to think, if it had any justification at all, referred to the apparatus used in its manufacture, the acetifier, then patented by one Ham, of Bristol, and which was for all practical purposes the same as is used to-day.

This process held its own without much variation until recent years, when the great cheapening of sugar, consequent on the beetroot industry, assisted by the abolition of the sugar-duty in 1874, again made the use of that article possible.

The second statement I am inclined to challenge is this: "There is undoubtedly a popular preference for, or prejudice in favour of, malt vinegar." My own experience is that so long as the consumer gets *vinegar—i.e.*, "a product of the consecutive alcoholic and acetic fermentations"—it is all he wants.

I recently asked a dealer of large experience, extending over thirty years, if *malt* vinegar was ever asked for. "No!" said he, "by no one but the inspector, and he is so conscious of asking for something unusual, that he demands *vinegar* and gets the admission that it is *malt vinegar* in course of conversation." And it would be strange if he had, for malt is not added to the mash, as is asserted by the authors of the paper, for the sake of giving a flavour. The one sole object for which it is used is the hydrolysis of the starch: it is a reagent, and nothing more; and no physical or chemical test whatever can show where malt is used to the exclusion of unmalted grain, or where it is wholly absent. The vinegars are identical; therefore to talk of apple or turnip pulp flavoured with raspberry, as an analogous case, is entirely erroneous.

If the turnip could be so treated as to cause it to assume the chemical and physical characteristics of raspberry, the simile would be borne out, but in that case why should it not be called raspberry jam?

I entirely agree with the authors of the paper in their desire to see the designation "malt vinegar" abolished; it was so, practically, until within the last six months, but the wording of the summonses in recent prosecutions, and the action of the inspectors in demanding malt vinegar, has brought it back again.

My only other criticism concerns the statement that there is an import duty on vinegar. There was a charge of threepence per gallon, but it was repealed in 1880,

probably in consequence of the fact that by the abolition of the malt tax the home-manufacturer no longer contributed to the Excise revenue.

I would like to appeal to those of you who are public analysts to consider the absurdly unequal way in which the phosphoric acid standard affects vinegar-makers. Let us assume two manufacturers working on the same lines; they shall both use rice as their raw grain, as legitimate a source of starch as rye, barley, oats, or maize, but one shall be a worshipper of the good old rule of thumb, and the other a believer in the doctrine that to waste material in manufacturing operations is to sin against science. The first uses more than sufficient malt for the supply of the diastase he requires; he purchases a dirty rice with plenty of adherent skin and husk; he gets bad fermentations with consequent low percentage of alcohol, and that is further wasted by unskilful acetification. The other uses his malt with more judgment; he hardens his brewing water for very obvious reasons; he buys perfectly clean rice; he closely watches his attenuations; and if results in this and the acetifier stage do not closely accord with the theoretical quantity, he is not satisfied until he has found a reason and a remedy. But whilst the vinegar of the first maker will show abundant phosphates, that of the second will only indicate some 0·2 or 0·3 of P_2O_5 in "total solids" as calculated, and he must either condescend to a trick in order to make his vinegar square with the ideas of a self-constituted and only partially informed tribunal, or he must take the risk of having to dance attendance at half the Petty Sessional Courts of the kingdom.

Discussion.

Mr. Allen was glad that the paper which he and Mr. Moor read on this subject should have elicited this communication from Mr. Collens. He had not the pleasure of knowing that gentleman, but from the style of his arguments he assumed that he had a close connection with the vinegar trade. They (Messrs. Allen and Moor) were indebted to him for pointing out errors from an historical point of view. Their information was not faultless in these respects, and he was glad that anyone should have placed these matters correctly before them. On the other hand, he thought Mr. Collens rather missed the point raised on the last occasion where he (Mr. Allen) tried to explain the position which was occupied with reference to these different materials, and how far the articles should be known as "vinegar" or "malt vinegar." There were manufacturers who gave the term "malt vinegar" to an article which was not brewed from malted and unmalted grain. Manufacturers were anxious to sell products of mixed origin as malt vinegar, and they had put considerable pressure on himself and other chemists to say they regarded such as malt vinegar. He expressed his own opinion on the subject at the last meeting, and he was sorry they had not got any definite expression of opinion from the Society, for it was really a burning question. Yesterday he attended the Petty Sessions at Keighley in support of a prosecution for selling as "malt vinegar" an article which he certified to contain the parts as under:

Malt vinegar	50 parts
Vinegar from sources other than malt (probably sugar)	$\frac{50}{100}$,,

As an "observation," he explained that by malt vinegar he understood a vinegar

brewed from a mixture of malted and unmalted grain. The manufacturers, Messrs. Grimble and Co., Limited, admitted the accuracy of the certificate, and stated that the vinegar was brewed from a mixture of malted and unmalted grain with sugar, but they contended that such an article had a right to be considered as genuine malt vinegar. In proof of this, they stated that they annually submitted samples of their malt vinegar to the Admiralty, which samples were analyzed at Somerset House; and when they failed to obtain the contract they inquired the reason, and had never been told that their product was rejected as not being genuine malt vinegar. In consequence of this indirect testimonial from Somerset House, and for want of an authoritative definition of malt vinegar, the magistrates dismissed the case. It was perfectly evident from recent cases that Somerset House were prepared to pass as genuine malt vinegar anything that was not distilled acetic acid in all its nakedness, and even that they would call "an artificial vinegar of commerce." Mr. Collens said if they could make a factitious raspberry jam so skilfully that a chemist could not distinguish it from true raspberry jam, it would have every right to be called raspberry jam. This was a most improper and immoral position. As chemists they knew their powers were limited, and it was preposterous to say that an imitation article had a right to be sold in place of the genuine because, at the present time, analysts could not distinguish the difference. If a customer asked for malt vinegar or raspberry jam he should be served with it. Let them take the case of a person who was a purchaser. He sees a bottle labelled "Pure malt vinegar," "Try so-and-so's pure malt vinegar," "Beware of imitations." Then the vinegar manufacturers come forward and say: "When we advertise malt vinegar we do not expect you to believe us. We don't mean malt vinegar when we so describe it; the people don't want malt vinegar; our vinegar is much better than malt vinegar, and keeps better." It seemed to him (Mr. Allen) an improper and illogical position to take up.

The Chairman (Mr. Hehner) said that whether the history of Mr. Collens was correct or not had not much to do with the question, but he thought that gentleman looked at the subject solely from the manufacturer's point of view. He had asked, Can an analyst discover whether it was malt vinegar or not? and he (the Chairman) thought that Mr. Collens gave the proper keynote to his paper when he gave the illustration about raspberry jam, and argued that, because the chemist might not be able to distinguish adulteration, surely that there should be the right to sell it as raspberry jam. If that were so, where would commercial honesty be? He was entitled to obtain that for which he asked; whether there was sufficient reason, it was not the chemist's or vendor's business to gauge. He asked for a thing, and the principle on which the whole Food Act was constructed was that he should have that for which he asked. Supposing, as they all knew to be the fact, that for one hundred years or thereabouts pure brandy had not been used in this country or not to any large extent, and that a very large proportion of brandy had been made from silent spirit, and that millions of gallons had been sold under the Food and Drugs Act, surely that did not give sanction to it; and if chemists could distinguish between real wine-brandy and the artificial mixture, would they not do so? Mr. Collens had entirely disregarded the principle of commercial honesty on which trade ought to be conducted.

AN IMPROVEMENT IN RICHMOND'S MILK-SCALE.

By Charles E. Cassal and B. Henry Gerrans.

(*Read at the Meeting December 6th*, 1893.)

We desire to show the members of the Society an improvement in the well-known piece of apparatus which we owe to our friend Mr. Richmond. Those who have been accustomed to use the slide-scale of Mr. Richmond to any great extent will no doubt have found that, at times, if not repeatedly, one loses the first number when one is looking for the second, and that an appreciable amount of time is thus lost in working with the scale. The main improvements consist in a movable index which marks the percentage of total solids on the scale, and in another movable index which can be placed on the number indicating the specific gravity. By putting the points of the adjusted needles opposite each other, one gets the desired results with far less mental strain. It is unnecessary for me to enlarge upon the advantages we have found from these additions. The improved scale has been made by Messrs. Baird and Tatlock. The only objection to the one now shown is that the needle for the total solid scale is rather long; it should be shorter and finer, to enable the graduations to be seen more easily. In addition, we have introduced a couple of knobs at each end of the movable scale, to enable the slide to be moved more readily. Another suggestion which, I think, is of importance—but which Messrs. Baird and Tatlock inform me cannot be carried out without considerable expense at present—is the further subdivision of the total solid scale and of the fat scale. While the formula on which the scale is based is perhaps not absolute, we think Mr. Richmond will agree with us that there is no reason why the subdivision should not be carried further. We mention this so that when these scales are re-manufactured a further subdivision should be introduced. It will be found that the improvements now shown render the use of the scale practically automatic. It may be mentioned that we do not necessarily bind ourselves to the particular form of the apparatus now shown. In this form, Messrs. Baird and Tatlock were best able to carry out what we required with the minimum of expense. We have used another form of the apparatus for a long time, in which the indicator is only applied to the total solid figures; the way in which the piece of metal clasps the scale is perhaps a little more satisfactory in this form.

Mr. Richmond said the improvement was ingenious, but, as far as he was personally concerned, he found it to be a matter of habit and training to find the two numbers almost instantaneously. If when finding one he kept his eye on it until he came to the other, he found it was done quickly. Personally, he did not feel to want the aid of a pointer to help him to come to that idea, but he could quite understand that to many men it would be an advantage. Some five years ago exactly the same idea was suggested to him, but he had always thought that it was not necessary. As Mr. Cassal, however, had done it, and produced a neat-looking instrument, he hoped those people who found it convenient would take his (Mr. Cassal's) view.

Mr. Cassal, in reply to a question from the Chairman, said that the cost of

the improved scale was 7s. 6d. Messrs. Baird and Tatlock now sold the original scale at 5s., and with the additions now shown they proposed to charge an extra 2s. 6d. It was perhaps necessary to say that Mr. Gerrans and himself had not patented the improvement with a view to derive any pecuniary advantage from its sale. He was sure that those analysts who had been in the habit of using this scale every day and very extensively would agree that it was easier to have the figures marked out by what amounted to an automatic process, and that this was better than a process which involved more time and fatigue. Mr. Gerrans and himself had found these improvements extremely useful; they saved a very considerable amount of time, involved far less mental strain in carrying out work—when, say, twenty or thirty milk analyses had to be dealt with—and the operations performed with the scale were more certain and accurate. Even people possessed of the remarkable powers described might make mistakes. The improved scale would be found to afford a guarantee against error.

The Chairman thought the improvement would be very useful to many. He himself often had to look twice for the figures. It would help to make this scale a still more useful article, by making it still more easily used. He thought the milk-scale of Mr. Richmond had hardly had the recognition which it deserved. When visiting other laboratories and making a request for a milk-scale, he had often found it absent, although he (Mr. Hehner) had found it indispensable.

AN ADJUNCT TO THE MILK-SCALE.

By H. Droop Richmond.

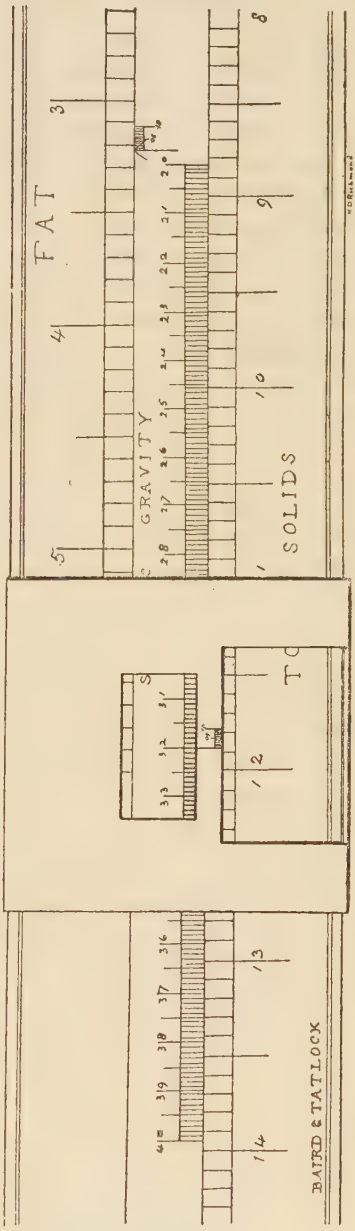
Messrs. Cassal and Gerrans lately exhibited to the Society a milk-scale with pointers to mark the specific gravity and total solids from which it is desired to calculate the fat.

I mentioned in the discussion that Mr. A. E. Johnson had previously suggested the idea to me, and that since then other gentlemen had also mentioned it; personally—perhaps from continued usage of the milk-scale—I had not felt the least difficulty in adjusting the slide without such aid. I suggested to Mr. Johnson that, by turning the slide round so that the arrow pointed to the total solids, he would find the use of a pointer unnecessary, and have frequently used this way of working the instrument, which has, however, the disadvantage that the figures on the specific gravity slide are inverted. Since seeing the arrangement of Messrs. Cassal and Gerrans, I have given the use of a pointer a serious trial, with the result that both I and my assistants find it a relief to the mental strain involved in calculating many results.

The modification of Messrs. Cassal and Gerrans is unnecessarily complicated; the use of two pointers is not needed, and increases the trouble of using it, and in the instruments exhibited they were liable to shift. The annexed figure shows a slide made from a piece of sheet-brass, bent so as to encircle the scale, the hinder

portion acting as a spring. The line is adjusted to the total solids; the specific gravity is then brought even with the line, and the fat is read off by the arrow.

In the figure decimal scales are placed by the side of the line which shows the total solids and the arrow which shows the fat, and by these results can be read to ·01 per cent. I do not recommend this addition, as the divisions are so small as to fatigue the eye, and the accuracy of the graduation must be to at least $\frac{1}{200}$ of an inch, which will greatly increase the cost of the instrument; they are placed in the figure simply to show that readings to ·01 per cent. could be obtained if necessary.



WATER ANALYSIS—THE INTERPRETATION OF RESULTS—*Concluded.*

By F. Wallis Stoddart.

Reprinted from the "Practitioner."

General Conclusions.

The preceding considerations, then, appear to me clearly to prove—

(1) That natural waters can at most obtain from one-tenth to two-tenths of grain of nitrogen as nitrates per gallon from sources other than animal matter.

(2) That practically the whole of the nitrogen of sewage may be oxidized into nitric acid without materially diminishing the risk involved in drinking it.

Let us, then, state the case in this way. The one most characteristic constituent of sewage is nitrogen; in the absence of nitrogen in some form of combination it cannot be said that water is polluted with sewage. This nitrogen contained in the original excrement as a constituent of organic compounds, assumes, as it were, a series of disguises under the influence of a succession of fermentative processes, appearing at one time as ammonia, at another as nitrite, at a third as nitrate, and so on, probably becoming at no distant period the free element. All this time it may be accompanied by the specific infective matter of cholera, enteric fever, and probably other diseases.

It is the duty, then, of the water analyst to detect the nitrogen under these disguises, gathering, of course, all additional information obtainable from other determinations; and as we have no reliable proof as to when the danger, of which the detection of sewage products is the sole indication, ceases, we must regard it as still existing so long as the chemical evidence of pollution is forthcoming.

When the proportion of nitrogen, in whatever form, amounts to a grain per gallon and upwards, so that the water plainly consists largely of sewage whether oxidized or not, the danger of drinking it must be obvious to anyone who bestows a thought on the matter. For even if the view be not adopted that the specific poison may persist in the water at this stage, the presence of so large a proportion of sewage products argues close proximity to the source of pollution; whilst if it be admitted, as I think it must, that the infective character of the sewage may be unimpaired, the danger is all the more imminent. The proposal to consider a water safe so soon as the nitrogen has assumed the oxidized condition, irrespective of the quantity that may be present, is then entirely irrational, and incapable of support by any kind of argument. Indeed, there are cases on record where outbreaks of typhoid have been traced to water of this character,* and there are others where the extent of percolation was so great, as, for instance, in the well-known Lausen and Havre epidemics, that nitrification must have been completed. In the Havre case the polluted water must have percolated through no less than 45 metres of chalk before reaching the spring-head; and it is impossible to imagine that any appreciable amount of nitrogen escaped oxidation, though I have been unable to obtain any analysis of the water.

It is a more difficult matter to decide whether we should permit any evidence of this form of contamination at all in a water. It appears clear to me that, whatever class of water is under consideration, seeing that average sewage contains about 5 grains only of nitrogen per gallon, a quantity of nitrogen as nitrates exceeding 0·5 grain per gallon indicates either dangerous proximity of the well to a source of pollution, or such easy communication with it that the distance separating the two points is no guarantee of purification: hence such water should be regarded with the greatest suspicion. With smaller quantities than this it becomes desirable to take into consideration the special circumstances of each case particularly, with a view to ascertaining whether the small excess is due to a slight admixture of recent sewage, or to a nearly complete removal of the sewage products by natural filtration. In the former case the water would be in the same position as that which was lately the cause of an epidemic in Chester-le-Street,† where, owing to dilution of the specifically infected sewage, no very definite chemical evidence of pollution was obtainable; in the latter everything depends upon the confidence placed in the purifying effect of natural filtration, in which connection the above-mentioned cases are of obvious importance.

I have purposely refrained from referring more than was unavoidable to the opinion expressed by English writers on this subject, partly because their views are

* Cf. *Supplementary Report of Medical Officer of the Local Government Board*, 1874: Haines, *Journ. Franklin Inst.*, 1881, etc.

† Report by Dr. T. Eustace Hill to the Durham County Council, April, 1893.

well known, and partly because it is very undesirable to perpetuate any personal feeling, such as was at one time associated with the question in most minds. But I may be permitted to refer to what I consider to be one of the most important contributions to the whole subject of water analysis ever published, I mean the report by Professor Mallet to the American National Board of Health on the Determination of Organic Matter in Potable Water. This report contains a very detailed examination of all the leading processes, and contains amongst other conclusions this remark: "No aspect in which I have compared together the good and bad natural waters has afforded so definite a result as this," *i.e.* the presence of nitrates and nitrites.

In conclusion, I may be permitted to give the essential points of the case which induced me to pen the preceding remarks. A shallow well in millstone grit, and under the most unsatisfactory conditions possible as regards surroundings, was found to yield water largely polluted with oxidized sewage, and was accordingly condemned. Opposition being made, a sample was ordered to be sent to Somerset House, and the results of analysis obtained by the chemical staff there, practically corroborating mine, were as follows:

	Grs. per gal.
Free ammonia, ·03 per mil. ... ... =	·002
Albuminoid ammonia, ·068 per mil.... ... ... =	·0048
Oxygen absorbed in three hours ·037 per 100,000... ... =	·026
Chlorides (as sodium chloride) ... ... =	5·9
= chlorine ... ... =	3·58
Nitrates (as nitric acid) ... ... =	9·4
= nitrogen... ... ... =	2·44
Total solids ... ... =	55·5

The opinion appended was that "although the water is unsatisfactory in some respects, and one we should not recommend, we do not feel justified, from a consideration of the results of the analysis, in giving an opinion that the use of the water for potable purposes would be dangerous to health."

Now, if there were any alternative explanation of the composition of this water still, having regard to the insanitary condition of the surroundings, I maintain one would be justified in condemning the water as dangerous to health. But when it is incontestable that the water consists very largely of the leakage from drains, the proximity of which to the well was clearly explained to the Somerset House chemists, and which, indeed, they refer to as "almost dangerous" in the earlier part of their Report, it is perfectly unintelligible how anyone accustomed to weigh evidence can escape the conviction that this well is a constant source of danger to the very numerous persons who habitually use it.

However, my present object will be attained if I succeed in inducing those who are engaged in water analysis, and who have been hitherto content to ignore nitrates altogether, to take the question into serious consideration. I am convinced the result will go far towards putting an end to the possibility of extensive outbreaks of cholera or typhoid amongst our crowded populations, now to an unsuspected extent dependent upon the defects in their own drainage systems for their water supply.

Cotton-seed Stearin and Maize-oil. F. Hart. (*Chem. Zeit.*, 1893, xvii. 1522.)—The comparatively scanty literature concerning cotton-seed stearin and maize-oil (*cf.* ANALYST, 1893, 191), and the considerable use of the former as an adulterant of lard, have led the author to give the analytical figures obtained by the examination of samples obtained direct from the manufacturer. Spuller's results for maize-oil are appended for the sake of comparison:

	Cotton-seed Stearin.	Maize-oil.	
		Hart.	Spuller.
Colour and consistency	bright yellow; buttery	dark-brown; fluid	—
Specific gravity	0·867 at 100°C.	0·9239 at 15°C.	—
Melting-point	30—31°C.	—	—
Melting-point of fatty acids	45·5—46·5°C.	25°C.	—
Free fatty acid calculated as oleic acid	neutral	0·75%	—
Hehner's number	96·3	95·7	94·7
Saponification number	194·6	189·5	188·1—189·2
,, ,, of fatty acids	—	—	198·4
Iodine absorption	93·6	117·0	119·4—119·9
,, ,, of fatty acids	—	—	125·0
Unsaponifiable matter	0·56%	1·55%	1·35%
Rise of temperature with sulphuric acid	... 48°C.	60·5°C.	56·0°C
Colour reaction with sulphuric acid	dark purple red	fine dark red	—
Reaction with Bechi's reagent	deep black	slightly darkened	—
Reaction with Wellman's reagent	dark green, fine blue with NH_3	dark green, fine blue with NH_3	—

From these figures it appears that, although cotton-seed stearin is well adapted for use as an adulterant of margarine and lard, yet it can be fairly easily detected by the determination of the iodine absorption, by the rise of temperature with sulphuric acid, and by Bechi's and Wellman's tests. B. B.

The Determination of Alkali in Alkaline Arsenites. G. Favrel. (*J. Pharm. Chim.*, 1893, xxviii. 301; through *Chem. Zeit.*)—Cochineal is indifferent to arsenious acid, on which account it can be used to determine the total alkali in alkaline arsenites, the examination of which resolves itself into the titration of the arsenious acid with iodine and the determination of the base in the manner mentioned above. B. B.

Detection of Saccharin in Wines, Liqueurs, or Beer. E. Spaeth. (*Zeits. angewand. Chem.*, 1893, 579.) The isolation of saccharin from wines and liqueurs, by means of a separatory funnel and immiscible solvent, is not advisable, since gelatinization of the mixture is very apt to occur, which renders the separation of

the solvent a tedious and troublesome operation. The author proposes the following method, which is somewhat similar to that used for the separation of glycerin from wines or beer. In operating with beer, unless the hop resin be previously removed, it is extracted along with the saccharin, and masks the sweet taste of the latter. For wines and liqueurs the sample is evaporated to 10 or 20 c.c. with coarse sand in a porcelain dish, and the residue, after treatment with 1 or 2 c.c. of phosphoric acid, is extracted by gently warming it on the water-bath with a mixture of equal parts of ether and petroleum ether (b.p. 60°), and breaking it up with a glass rod. The solution is filtered through purified asbestos (filter-paper takes up saccharin) and the extraction repeated until 200 to 250 c.c. of filtrate have been obtained. The solvent is next distilled off on the water-bath, and the residue freed from the last traces of it by warming and blowing in air. A few drops of a well-diluted solution of sodium carbonate are then added to dissolve the saccharin, which may here be detected by its taste, and the contents of the flask are washed into a porcelain dish and evaporated nearly to dryness. From 1 to 2 grammes of solid sodium carbonate are now added, and the mixture is gradually added in small portions to fused potassium nitrate. The melt is dissolved in water and the sulphuric acid in it determined.

For beer, the hop-bitters are first removed by precipitation with copper nitrate. 500 c.c. of the beer are mixed in a dish with a few crystals of copper nitrate, whereby the hop-bitters are thrown down as a flocculent precipitate, which, however, need not be filtered off. The liquid is evaporated to a thin syrup, a sufficient quantity of coarse sand, and a few c.c. of phosphoric acid are added. The extraction, with a mixture of ether and petroleum-ether is conducted as described for wines. So little as 0·001 per cent. of saccharin can be detected by the sweet taste of the sodium carbonate solution of the ether and petroleum ether residue. The estimation of the saccharin may be performed by fusion with potassium nitrate as described above.

When very small quantities of saccharin have to be estimated a larger quantity of beer must be used, in which case the sandy residue becomes too large and unwieldy for extraction with the solvent. In such a case the acidified sandy residue may be first extracted with warm alcohol, the alcoholic solution filtered through asbestos, evaporated, and the residue extracted as already described with the mixture of ether and petroleum ether. A. G. B.

The Analysis of Rubber Goods. **D. Holde** (*Chem. Zeit.*, 1893, xvii. 1634-35).—The author, continuing his investigations on the improvement of methods for the proximate analysis of rubber goods (The Analyst, xviii. 147), has endeavoured to ascertain whether the fact mentioned by Henriques in the latter's papers on the same subject (The Analyst, xviii. 13), that ordinary organic solvents extract an appreciable amount of matter from pure rubber, invalidates his (the author's) process for the determination of mineral and fatty oil in rubber mixtures. The solvent used by the author is ether-alcohol in the proportion of 4 to 3, and the chief difficulty apprehended was the possible necessity for repeated extraction to remove the whole of the fatty or mineral oil, as by such repetition the amount of extract from the rubber

itself would be unduly increased. Experiments were therefore made to determine whether satisfactory extraction of the oil without too great solution of the rubber could be secured. The general procedure consisted in reducing the rubber to as fine a state of division as practicable by filing it with a clean file, and extracting it on an ordinary filter-paper with known quantities of the solvent (ether-alcohol), evaporating the solution and weighing the residue. This was done with pure rubber, and with the same rubber which had been allowed to soak up known amounts of various oils. The chief results are recorded in the following table:

Kind of oil and rubber.	Percentage of oil used.	Percentage of oil found.
White erasing rubber + rape-oil	22·1	22·1
Ditto ditto	12·9	14·1
Ditto ditto	18·5	20·2
Ditto ditto	26·8	28·4
Ditto + cotton-seed-oil ...	59·8	59·7
Rubber cork + rape-oil	15·7	12·9
Ditto ditto	26·2	24·2
White rubber-tube + rape-oil	26·7	23·8
White rubber-tube + cottonseed-oil ...	39·3	37·7
Ditto ditto	60·2	58·6

The samples of rubber yielded amounts of soluble matter, consisting of the oily constituent of rubber and free sulphur, varying from 3·7 per cent. to 7·1 per cent. The values given above for the quantity of oil found, have been corrected by the deduction of 5 per cent. from the percentage actually obtained, that being a fair mean from the results of the experiments on pure rubber. In general 60 c.c. of the solvent were used, although 30 c.c. were found sufficient in some cases. The chief cause for the discrepancies of the observed and true percentages of oil is the variation of the quantity of soluble matter yielded by the rubber itself. Greater accuracy could be attained if necessary by the determination of the free sulphur in the soluble matter, thus eliminating one of the two unknown quantities. B. B.

Kapok-Oil. R. Henriques. (*Chem. Zeit.*, 1893, xvii. 1283.)—Certain plants of the *Malvaceæ* resemble those classed under the title *Gossypium* (the true cotton-plants) in possessing a filamentous covering on their seeds. Inferiority in mechanical properties, *e.g.*, length and strength of fibre, prevents the use of this material for the same purposes as cotton. The best known of these plants is the *Kapok* (*Eriodendron anfractosum*, Dec., *Bombax penandrum*, L.), which grows in the Dutch East Indies; its cotton is used for stuffing beds and mattresses in place of horsehair. The seed itself is similar to cotton-seed, in that oil can be expressed from it, such oil being used as a food, and for soap-making in Holland. As will be seen from the analytical constants obtained on the examination of the oil, it is of the same class as cotton-seed-oil. The sample examined by the author possessed the following characteristics:

The oil was of greenish-yellow colour, and slight inoffensive smell and taste. It was viscous and turbid, becoming clear, however, on standing from the separation of stearin, analogous to cotton-seed stearin. When treated with sulphur chloride or sulphuric acid, Kapok-oil evolves considerably more heat than does cotton-seed-oil.

The rise of temperature with sulphuric acid (determined in the manner recommended by Archbutt) is 95° C. Strong nitric acid gives a coloration similar to that produced with cotton-seed-oil, but the reaction takes place more slowly, and the shade is rather green-brown than red-brown. Complete saponification is accomplished with some difficulty. The fatty acids are easily soluble in petroleum ether, and are therefore free from hydroxy acids. The following figures for the usual criteria of an oil are given:

Specific gravity at 18° C.	0·9199
,, ,, of fatty acids	0·9162
Fusing-point ,, ,, ,, ...	29°
Solidifying-point of fatty acids	23-24°
Saponification number of oil	181
,, ,, fatty acids ...	191
Mean molecular weight of ,, ,, ...	293
Iodine number of oil	116
,, ,, fatty acids	108
Hehner's number	94·9

Kapok-oil is, therefore, somewhat more drying in character than cotton-seed-oil.

B. B.

Composition of Pepper. E. v. Raumer. (*Zeit. angew. Chem.*, 1893, 453-457.)—The adulteration of black pepper with the cortex which has been removed from another portion for making white pepper cannot be detected by the microscope. The author has therefore turned his attention to the composition of the cortex as compared with that of the pure pepper.

For the estimation of starch, 5 grammes of pepper are boiled with 200 c.c. of water for half an hour under an inverted condenser. After the contents of the flask have cooled to 65°, some pure diastase (prepared after Lintner) is added, and the liquid kept at 65° for four to five hours. 25 c.c. of lead acetate are now added, and the whole made up to 250 c.c. After an hour, during which time the flask is intermittently shaken, 200 c.c. are filtered, and a concentrated solution of potassium hydrogen carbonate is added to the filtrate, whereby the excess of lead is precipitated. The liquid is again made up to 250 c.c., 200 c.c. are filtered and neutralized with acetic acid; 20 c.c. of 25 per cent. hydrochloric acid are added, and the liquid finally heated under an inverted condenser for two hours and a half. The starch is now completely inverted, and the reducing value of the solution may be taken.

Cellulose is determined after Henneberg and Stohmann's method.

The moisture in the pepper cannot be determined at 100°, owing to the volatilization of essential oil; even over strong sulphuric acid some of this oil is lost, as evidenced by the darkening of the acid.

The quantity and composition of the ash of black pepper is known to differ considerably from that of white pepper. Black pepper has more ash than white, and this ash contains more alkali. But so wide are the limits of variation that this knowledge is of little value in detecting cortex in black pepper.

The percentage of phosphoric acid in the cortex ash varies from 3·9 to 4·4, while that in the black pepper ash varies from 5·7 to 10·2. Even here, however, admixture leaves the analyst in doubt. As a rule, the specifically lighter sorts of pepper

approach cortex so nearly in content of phosphoric acid and alkali that the better sorts of pepper can be mixed with cortex and be disposed of as lighter sorts.

The same remarks have, unfortunately, to be made of the content of cellulose and starch. Calculated on the ash-free substance, the highest percentage of cellulose in pure pepper is 25·1; the lowest in cortex is 29·1. The highest percentage of starch in cortex is 16·5; the lowest in pepper is 24·0. In pure black pepper the cellulose will vary between 11 and 25 per cent.; starch, between 24 and 47 per cent., still calculated on the ash-free substance. The starch falls in percentage as the cellulose rises.

It would seem as though these figures were sufficiently dissimilar to permit of the immediate detection of admixture of cortex to black pepper. Yet this is not so. Witness a sample, known to be a mixture, which gave a high ash and alkali content, but so much as 25·6 per cent. of starch, and so little as 19·7 per cent. of cellulose, calculated on the original substance, or 30 per cent. and 23 per cent. respectively calculated on the ash-free substance. Such figures for starch and cellulose are well within the limits for black pepper given above.

The author hopes that the estimation of the alcohol (?) extract of the sample may help in the detection of cortex fraudulently present, for this portion of the peppercorn contains more oil than the kernel does.

The following figures illustrate the author's points:

	Penang. Per Cent.	Penang. Per Cent.	Singapore, sifted. Per Cent.	Lampong. Per Cent.	Penang, lightest sort in London Market. Per Cent.
Water yielded to H_2SO_4 ...	10·016	10·000	13·306	14·170	9·970
Ash	4·107	4·200	3·510	5·035	5·732
Ash insoluble in H_2O ...	2·923	2·380	1·753	3·113	2·995
Ash insoluble in HCl ...	1·075	0·922	0·290	0·740	1·062
Phosphoric acid in ash ...	9·58	9·940	9·990	7·490	7·340
Cellulose in dry, ash-free substance	11·47	13·130	18·650	18·320	22·580
Starch in dry, ash-free substance	46·90	46·250	32·080	27·410	28·060

	Pure Cortex. Per Cent.		Cortex as separated by Machine. Per Cent.			White Pepper Dust obtained during decortication.* Per Cent.
Water yielded to H_2SO_4 ...	10·10	6·21	10·56	9·42	11·44	7·77
Ash	6·51	7·06	7·05	8·12	9·37	3·82
Ash insoluble in H_2O ...	3·25	3·62	2·41	3·71	5·21	2·51
Ash insoluble in HCl ...	0·56	0·81	0·34	1·33	2·43	0·34
Phosphoric acid in ash ...	3·96	3·69	4·47	4·09	3·70	12·76
Cellulose in dry, ash-free substance	34·86	34·52	29·10	34·88	36·81	11·68
Starch in dry, ash-free substance	16·57	13·49	15·34	10·28	7·87	43·68

A. G. B.

* This resembles smaller sorts of white pepper both microscopically and macroscopically. It contains cells rich in starch granules.

The Products of the Sublimation of Arsenic. J. W. Rettgers. (*Zeit. anorg. Chem.*, 1893, iv. 403; through *Chem. Zeit.*)—The significance of arsenical mirrors both in toxicology and in ordinary blow-pipe testing has induced the author to investigate the modifications of arsenic that may occur in this form. He has arrived at the following conclusions:

There is no amorphous form of arsenic, the variety generally thus called being crystalline. Two modifications can be distinguished; they are a hexagonal silver-white variety possessed of metallic lustre, and being both specifically heavier and also less volatile than the second kind, which is black in colour, crystallizes apparently in the regular system, and constitutes the true arsenic mirror. The former modification corresponds to red hexagonal phosphorus (red phosphorus having been recently proved by the author to be crystalline), and the latter to yellow phosphorus, which crystallizes in the regular system. Both modifications of arsenic are perfectly opaque; deposits which are yellow or brown, and more or less transparent, consist of the suboxide and hydride, As_2O and AsH. The brown spot on porcelain produced by contact with a flame of arseniuretted hydrogen is not a thin film of As, but one of the brown solid hydride AsH, formed by the decomposition of AsH_3. This view is confirmed by the fact that arsenic sublimed in an indifferent gas (*e.g.*, CO_2) is deposited in one or other of the modifications described above, the brown transparent product being obtained only in the presence of H or O. Moreover, pure arsenic is insoluble in all solvents, whereas the film on porcelain (AsH) is soluble in many solvents, including hydrocarbons of the benzene series (*e.g.*, xylene), warm methylene iodide and hot caustic potash. B. B.

Furfurol as a Reagent for Sesame-Oil in other Oils. V. Villavecchia and G. Fabris. (*Zeit. angew. Chem.*, 1893, 505, 506.)—It has been pointed out by other observers that the colour reactions obtained by treating oils, albuminous substances, alkaloids, etc., with sugar and sulphuric acid are really reactions of furfurol with these compounds.

By saponifying sesame-oil with baryta, and extracting the soap with alcohol and petroleum ether, the authors have succeeded in isolating from sesame-oil: (1) a higher alcohol, $C_{25}H_{44}O$, melting at 137°, and having a specific rotation of $[\alpha]_D^{20} = -34° 23'$ (C = 5·013); (2) a crystalline substance, which they call *sesamin*, and which melts at 123° and has a specific rotation of $[\alpha]_D^{20} = +68·36$ (C = 24·45); (3) a viscid, non-crystallizable, nitrogen-free oil, which contains the substance to which the colour reactions of sesame-oil are due.

The substitution of furfurol for sugar and sulphuric acid in testing for sesame-oil is effected as follows: 0·1 c.c. of a solution of 2 grammes of furfurol in 100 c.c. of alcohol is placed in a test-tube, and 10 c.c. of the oil to be tested are added, followed by 10 c.c. of hydrochloric acid (sp. gr. 1·19). The tube is shaken for half a minute, and allowed to stand. Should the oil contain sesame-oil, even less than 1 per cent., the aqueous liquid which settles in the tube will be coloured carmine-red. Instead of 10 c.c. of acid, 1 c.c. may be employed, and the mixture shaken with 10 c.c. of chloroform until the oil has all dissolved; the red colour will appear in the aqueous layer. In the absence of sesame, olive-oil gives no colour save a dirty-yellow tint; a rancid olive-oil may give a greenish colour.

Experiment with a large number of seed, fish, and mineral oils convinces the authors of the certainty of the test.

A. G. B.

BAKING POWDER NOT AN ARTICLE OF FOOD.

HIGH COURT OF JUSTICE.—QUEEN'S BENCH DIVISION.

Before Mr. Justice Hawkins and Mr. Justice Lawrance.

(*Reprinted from the "Times."*)

JAMES *v.* JONES.

This was an appeal from the Quarter Sessions of Glamorgan, affirming a conviction of the appellant by four justices on February 15, 1893, for that he on December 10, 1892, unlawfully did sell to Jones, an inspector under the Foods and Drugs Act, a certain article of food—to wit, baking powder—which had been mixed with a certain ingredient—to wit, alum—injurious to health. The appeal was heard on December 18 last, and

Mr. Justice Hawkins, in delivering the considered judgment of the court, said: The facts seem to be that on December 10, 1892, James sold Jones a packet of Excelsior Baking Powder, for making light and wholesome pastry and puddings, etc., without yeast. On the wrapper were directions as to how much to use, and how to mix it. The object of using the powder was to diffuse carbonic acid gas through the dough, so as to cause it to expand and render the bread, cake, or pastry when baked light and digestible. The baking powder contained 20 per cent. bicarbonate of soda, 40 per cent. alum, and 40 per cent. ground rice. Carbonic acid gas is contained in the bicarbonate of soda, and to liberate this gas properly a chemical combination of an acid with the bicarbonate of soda is necessary. To effect this combination alum is used, the ground rice being added to keep the two in good condition. The ground rice does not pass off with the gas, but remains in the bread. The alum and the bicarbonate of soda, however, assume another form, in which, when eaten with the bread, they are injurious to health. The Sale of Food and Drugs Act, 1875, 38 and 39 Vic., c. 63, in its preamble recites the necessity for food being sold in a pure and genuine condition. Section 2 enacts that food shall include every article used for food or drink. Section 3 enacts that no person shall mix any article of food with any ingredient so as to render the article injurious to health with intent that the same shall be sold in that state. We are asked to say (1) whether the baking powder is an article of food within the meaning of the statute, and (2) whether James sold it to Jones mixed with an ingredient—to wit, alum—injurious to health. Section 3 creates two offences, mixing and selling, and it is the latter James is charged with. The sale of alum is in itself not an offence, even though the seller may know the buyer is going to mix it with bread, and therefore the fact that the alum is sold mixed with other things does not alter the position. No one would dream of using the ground rice contained in the baking powder as an article of food, as it is part of the mixture, injurious or otherwise. One might as well say that poison and flour in equal parts was "food," because flour is a "food." The test is whether the article when sold is an article of food or not. Though the purchaser, if he afterwards mixes it with intent to sell, may commit an offence, the vendor would not be committing one. We are clearly of opinion that the baking powder is not an article of food, and neither the sale of it, nor the admixture of it with an article of food, unless such article is intended for sale, is an offence. For his own use anybody may use it, and, that being so, it would be strange for the vendor to be liable to penalties. We do not, however, mean to convey it as our opinion that nothing can be deemed to be an article of food unless made up into an eatable or drinkable form, such as flour, butter, salt, mustard, pepper, etc., for although no one would dream of eating them alone, yet they are intended to be consumed by mankind. We think the Court of Quarter Sessions was wrong in treating baking powder as an article of food. It is unnecessary to answer the second question. The order of the Quarter Sessions and the original conviction must be quashed.

Sir R. Webster, Q.C., Mr. Brymnor Jones, Q.C., and Mr. Macmorran were for the appellant; Mr. Finlay, Q.C., and Mr. Rhys Williams for the respondent.

Erratum.—In third column of table on page 21 of preceding number, *for* "Oxygen absorbed in four hours" "0·45" *read* "0·045."